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BAITS AND TRAPS FOR THE CONTROL OF TOBACCO AND TOMATO HORNWORMS

By L. B. Scott and Joe Milam, Division of Truck Crop and
Garden Insect Investigations

Introduction

For many years the larvae of the tobacco and tomato hornworm moths (Protoparce sexta (Johan.)) and (P. quinquemaculata (Haw.)) have been known as important pests of tobacco in many parts of the tobacco-growing sections of the United States. These hornworms are also important pests of tomatoes.

Hornworms injure tobacco by devouring large portions of the leaves. The damaged leaves may be ruined for commercial purposes, or in case of moderately light feeding the quality, grade, and appearance of injured leaves are lowered. Where abundant, the hornworms sometimes defoliate the tobacco plants. In Tennessee, Kentucky, Virginia, North Carolina. South Carolina, Georgia, and Florida, where hornworms on tobacco are regularly or periodically abundant, it has been estimated that damage by hornworms reduces the weight of the potentially marketable crop approximately 5 percent annually, on an average. For the 10-year period 1929-38 the annual farm value of the tobacco crop in these States was approximately $182,000,000. A direct loss of 5 percent in the potential weight and value of this crop because of hornworm damage amounts to approximately $9,600,000 a year. This sum does not include the damage caused from reduction in quality, grade. and general appearance in the cured product of tobacco injured by hornworms. The losses from these causes are estimated to be at least equal to the losses suffered from reduction in weight. In addition, it is estimated that the cost of control operations against hornworms on tobacco, principally by applying insecticides and by hand picking, entails an annual expenditure of at least $1,000,000.

On tomatoes the hornworms feed on the fruit, as well as on the leaves, and cause extensive losses in some tomato-growing regions. No figures are available regarding the extent of such losses.

In searching for methods of controlling these hornworms on tobacco in such a manner as to avoid the presence on the cured product of poisonous or otherwise objectionable residues incurred by the use of available insecticides, extensive experiments have been performed in an attempt to determine the efficiency of baiting and trapping the parent moths of the hornworms, thus preventing them from laying their eggs on the plants.

Description of Baiting and Trapping Methods

The bait ordinarily used to attract hornworm moths is isoamyl salicylate, a chemical with a penetrating and pleasant odor. This chemical is placed inside an assembly known as a "feeder" (shown in figures 1 to 4, inclusive). The feeder consists of a slip-cover can 5-3/8 inches in diameter and 3 inches deep. It is painted medium dark green. In the center of the top of the can is inserted a 1-inch vial filled with isoamyl salicylate, provided with a loosely fitting cork and with a short length of wick which permits the odor of the chemical to escape. Inserted equidistantly around this vial in the top of the feeder, as shown in the illustrations, are three small white funnels made of tin and shaped to resemble blossoms of jimsonweed (Datura stramonium L.). The color and shape of these blossoms are imitated for this purpose because hornworm moths are attracted to and feed in large numbers on the blossoms of this plant. The apex of each of the funnels extends downward into and nearly to the bottom of the feeder. The feeder is filled with a poisoned liquid consisting of a sweetened solution containing 5 percent of tartar emetic. The holes at the apex of each of the funnels permit the poisoned liquid to enter the funnels.

The assembled feeders may be used with or without a screen wire housing, or trap. When the latter is used, two of the feeders are placed inside the trap in the manner illustrated in figure 1 to 4, inclusive. The number and location of traps for best results has not yet been determined. The hornworm moths are apparently attracted to the near vicinity of the trap by the escaping odor of isoamyl salicylate and are then visually attracted by the white funnels simulating jimsonweed blossoms. After entering the trap the moths feed on the poisoned liquid in the funnels and are retained within the trap until they die. When the feeders are used without a trap they may be placed at a height of approximately 5 or 6 feet, on the tops of posts. The disadvantage of using feeders alone, as compared with feeders inside the traps, is that when feeders are used alone the hornworm moths may deposit eggs on the tobacco plants after partaking of the poison and before they die, whereas when traps are used the moths are confined until they die.

Construction of Traps

The most satisfactory type of hornworm moth trap developed thus far is illustrated in figures 1 to 4, inclusive. This trap is 36" long, 34" high, and 24" wide, and is constructed of 3/4" x 1-5/8" wood strips

fastened at the corners by means of corrugated fasteners and 2-1/2" x 1/2" flat corner irons. With these strips 5 rectangular sections are made to form the framework of the top 24" x 36", the two sides 33" x 36" each, and the two ends 22½" x 33" each. Each end has one cross piece 19¼" long located 20" from the bottom. These sections are assembled by fastening the sides and ends together with 2" round-headed wood screws, the corners being strengthened by angle braces. The top is hinged to the upper edge of one of the sides. The baffle (figs. 1, 2, and 3, A), which hangs in the center of the trap, is made of 1/2"-mesh hardware cloth and is 19" long by 15" wide. It is supported by No. 9 wire, so formed that the baffle hangs 5" below the top of the trap, 4" from each side, and 12" from the ground. The wire support is formed into hooks which fasten to screw eyes on the sides of the trap (fig. 3).

The top, the two sides, and the part of each end above the cross-piece are covered with galvanized-iron screening having 12 meshes to the linear inch. The lower part of each end is also covered with this material cut and shaped so as to form a large funnel converging inward for a distance of 8" to form a circular opening 7" in diameter to serve as an entrance for moths. This entrance is formed on a 7" steel ring around which the screen wire is folded and soldered to itself. The large outer opening of the funnel is 20" high and 19¼" wide and is tacked to the inside faces of the lower part of the end section. The distance along the screen from the outer opening to the inner opening is 8" at the bottom, 9" at the sides, and 10" at the top.

Two feeders (figs. 1, 2, and 3, B) are supported by a cross member (figs. 1, 2, and 3, C) of 3/4" x 3" lumber resting edgewise, 1 inch from the ground, on small wooden brackets (figs. 2 and 3, D) fastened centrally to the bottoms of the inner faces of the two end sections of the trap. Each feeder is held in position by means of two strips of galvanized band iron, 7" long and 1¼" wide, fastened to the upper edge of the 3/4" x 3" support with a 1-1/2" round-headed wood screw. The screw passes through 3/16" holes in the centers of the iron strips and is tightened sufficiently to hold them at right angles to each other. These metal strips are upturned at the ends approximately 5/8" in order to hold the feeders in position. The feeder is so placed that the top of the green can is in the same horizontal plane as the bottom of the round inner opening (figs. 1 and 2, F) of the entrance funnel and is spaced 5" from it. Thus the small, white, blossom-like funnels of the feeders may be seen clearly by moths entering the trap.

Materials and cost of one trap (fig. 4) and its feeders are as follows:

Trap:		
60	linear feet of 3/4" x 1-5/8" lumber	$1.00
3	linear feet of 3/4" x 3" lumber	.06
50	square feet of 12-mesh wire screen	1.50
2	square feet of ½"-mesh hardware cloth	.10
30	inches of #9 steel wire	.03
14	inches of 1¼" band iron	.04
1	hook and eye	.02
2	screw eyes	.01
20	2½" x ½" flat angle irons with screws	.30
4	angle braces with screws	.08
8	2" round-headed wood screws	.02
2	1½" round-headed wood screws	.01
	Paint	.15
Feeders (2):		
2	5-3/8" x 3" slip-cover cans	.16
60	square inches of light-gauge sheet tin	.15
2	1" vials	.04
2	#2 lamp wicks	.02
2	corks	.02
	Paint	.01
		$3.72

The labor of one man for approximately one day is required to construct a trap and its feeders.

Construction of Entrance Funnels

The screen-wire funnels are made from patterns shown in guide books published for tinsmiths and sheet-metal workers. Books of this kind are available at mail-order houses or they may be obtained through any large book supply house. A pattern for a cone having rectangular base and round top should be used.

Trap Coloration

The results of tests with traps painted various colors do not show conclusively that coloration is an important factor in determining the effectiveness of a trap, although there can be little question that white traps are considerably less attractive than those painted green, red, yellow, brown, or black. Traps painted medium brown appeared to be somewhat more effective than those painted bright yellow, shutter green, bright red, or black, but this was not shown conclusively. It is suggested that traps be painted medium brown.

Baiting and Trapping for Hornworm Control

Although the baiting and trapping of hornworm moths has not as yet progressed to a point where its use results in an entirely satisfactory control of these pests, this method is being improved upon each year, and on the basis of available data there is reason to believe that it can be used to advantage in many localities, especially where the infestation is light or moderate. It has already been demonstrated that in areas of light infestation the damage by hornworms can be decreased materially by the use of baits and traps and that the employment of this equipment permits a marked reduction in quantities of insecticides otherwise required to prevent serious losses to tobacco from the feeding of hornworms. The hazard of insecticidal residue is also reduced by this method.

Small-scale tests conducted in 1941 in an area of very light hornworm infestation indicated that 10 feeders filled with sweetened bait containing 5 percent of tartar emetic, placed at regular intervals on the borders of a 3-acre field, or 4 traps similarly placed around a 1½-acre field, were sufficiently effective to obviate the necessity of applying insecticides. All other tobacco in the vicinity required the collection of the hornworms by hand or the application of insecticides to protect it from serious hornworm damage. Weekly examinations of 100 tobacco plants taken at random in each of the fields where the feeders or traps were used, as compared with similar examinations in two comparable fields where the feeders or traps were not used, indicated that the traps and feeders were very effective in protecting the plants from damage. The data obtained from these fields, which indicate that serious hornworm damage may be avoided in areas of light infestation, are summarized in table 1. No conclusive data are available at this time to show the extent of protection afforded to the tobacco crop by the use of baits or traps.

Table 1.--Results from the use of baited traps in tobacco fields for hornworm control

Field No.	Acres	Treatment	Number of observations	Plants examined	Eggs found	Larvae found	Other treatment
1	3.0	10 feeders	6	600	13	90	None
2	1.5	4 traps	5 4/	500	25	89	None
3	1.5	Check	6	600	29	330	Hand-wormed every day
4	2.1	Check	6	600	103	184	Two applications of lead arsenate; hand-wormed once

4/ Crop harvested prior to sixth observation.

Tobacco growers should not expect to obtain complete control of hornworms by the use of baits and traps in areas of heavy infestation, but it is believed that the use of this control method will reduce the infestation, lessen the damage from hornworms, and permit the grower to use smaller quantities of insecticide than would otherwise be necessary.

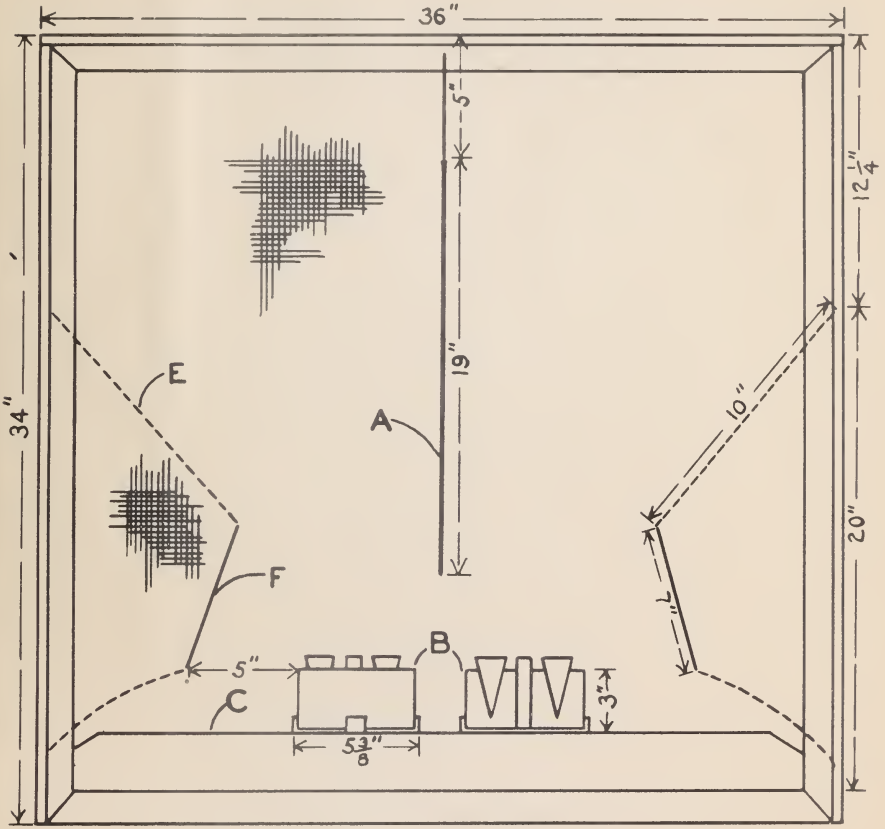
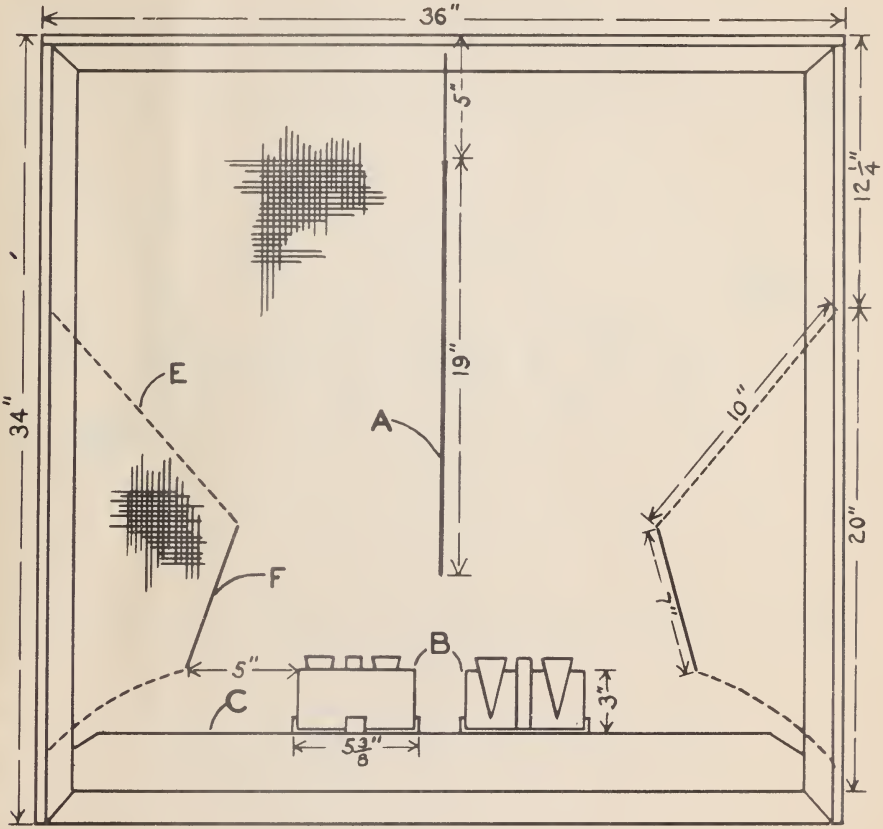


Figure 1.—Side view of hornworm moth trap. A, baffle; B, feeder, C, feeder support; E, entrance funnel; F, round inner opening of entrance funnel.



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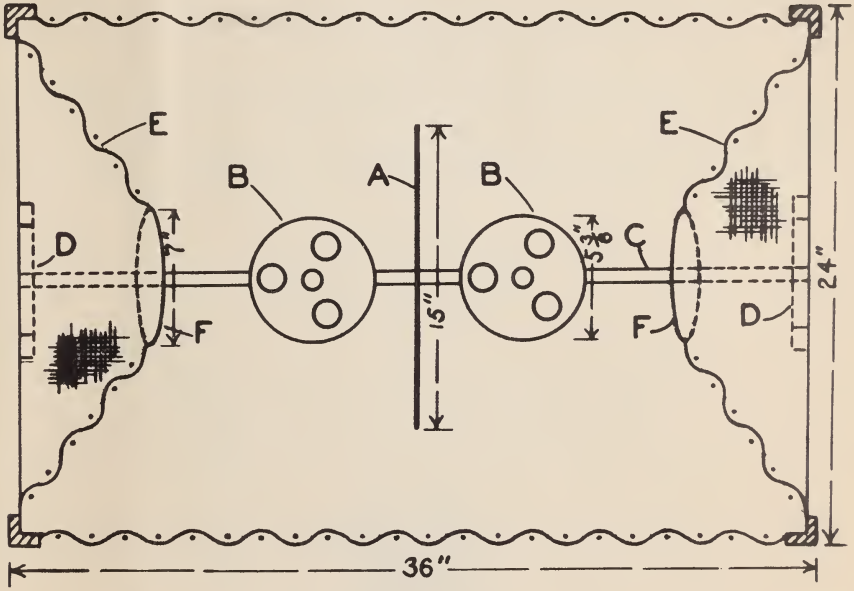

Figure 2.--Top view of hornworm moth trap. A, baffle; B, feeder; C, feeder support; D, bracket for feeder support; E, entrance funnel; F, round inner opening of entrance funnel.

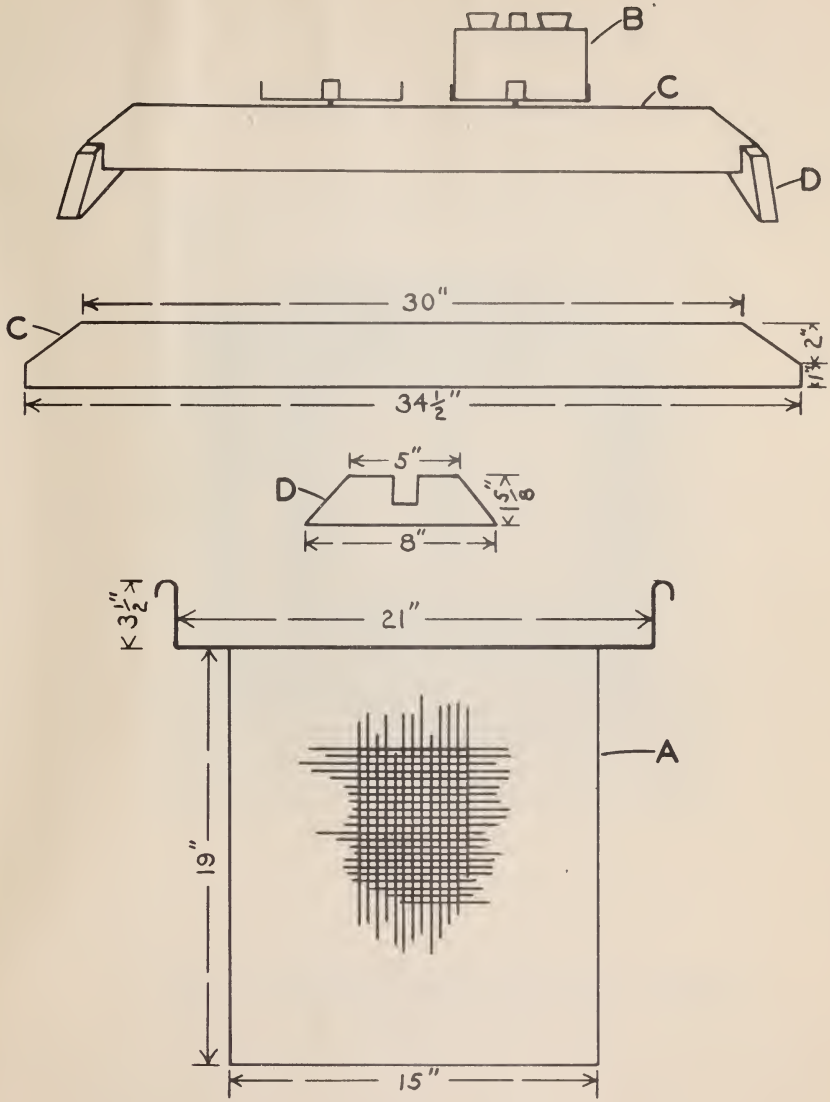

Figure 3.—Details of the construction of the feeders, feeder support, and baffle; A, baffle; B, feeder; C, feeder support; D, bracket for feeder support.

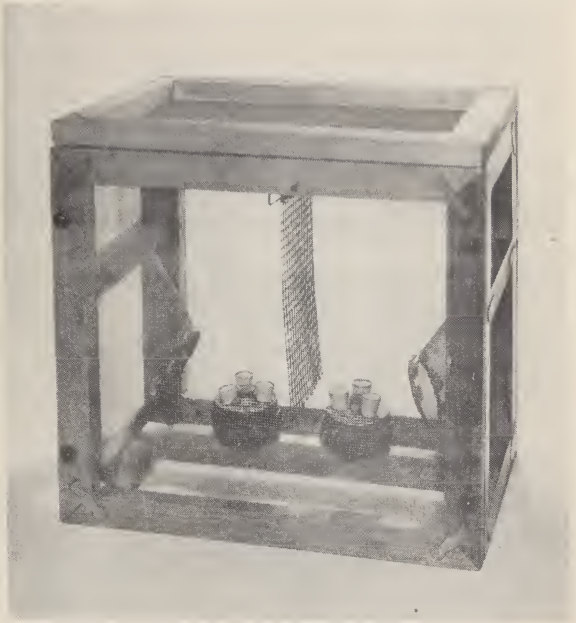

Figure 4.—View of assembled hornworm trap. Photograph made from a miniature model approximately one-third the size of the trap used in field tests.